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Planing And Design of A Prestressed Over Bridge At Eranhipalam

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Abstract—- **In this project we are doing planning, analysis and design of prestressed over bridge. A bridge is a structure providing passage over an obstacle without closing the way beneath the obstacle. It's used to cross may be a river or a road, In other words, bridge is a structure for carrying the road traffic or other moving loads over a depression or obstruction such as channel, road or railway. Superstructure or Decking, Bearings, and Substructure are the components of bridge. Prestressing is a method for overcoming concrete's natural weakness in tension. It can be used to produce beams, floors or bridges with a longer span than is practical with ordinary reinforced concrete**

Keywords—Key Words: Prestressed flyover, Superstructure, Decking, Bearing, Substructure

1.INTRODUCTION

Our project deals with the design of prestressed concrete over bridge at Eranhipalam junction, Calicut with an objective of reducing traffic congestion and there by reduces the number of accidents. Flyovers are the key elements in any road network. Use pre-stressed concrete flyover is gaining popularity in bridge engineering fraternity because of its better stability, serviceability, economy, aesthetic appearance and structural efficiency

1.1 DESIGN PHILOSOPHIES

There are three philosophies for the design of reinforced concrete namely:
1) Working stress method
2) Ultimate load method
3) Limit state method

1.2 OBJECTIVE

- Analyse need of flyover at the proposed site.
- Designing the flyover manually.

1.3. BRIDGE

A bridge is a structure providing passage over an obstacle without closing the way beneath. The required passage may be for a road, a railway,pedestrians, a canal or a pipeline. The obstacle to be crossed may be a river, a road, In other words, bridge is a structure for carrying the road traffic or other moving loads over a depression or obstruction such as channel, road or railway.

1.3.1. Components of bridge

The bridge structure comprises of the following parts.

- Foundation
- Piers and Abutments
- Substructure
- Bearings
- Wing walls and Returns

1.4. PRESTRESS

Prestressing is a method for overcoming concrete's natural weakness in tension. It can be used to produce beams, floors or bridges with a longer span than is practical with ordinary reinforced concrete. Prestressing tendons (generally of high tensile steel cableor rods) are used to provide a clamping load which produces a compressive stress that balances the tensile stress that the concrete compression member would otherwise experience due to a bending load.

1.4.1. Advantages of prestessed concrete

- Section remains un-cracked under service loads.
- Reduction of steel corrosion, thereby increase durability
- Full section is utilized
- Less deformation
- Suitable foruse in pressure vessels, liquid retaining structures
- Larger spans possible with pre stressing
- For the same span, less depth compared to reinforced concrete member
- Reduction in selfweight
- More economical section
- Suitable for precast construction

2. LOCATION OF SITE

- This project deals with the design of prestressed concrete over bridge at Eranhipalam junction, Calicut.
- The junction is connected to 2 highways, namely NH-47 and NH 766
- The proposed overbridge is across NH 766

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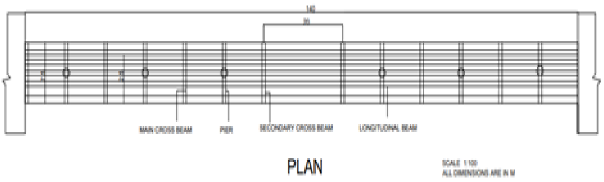
3. LOAD SPECIFICATIONS

A load is considered primary or secondary according to the part of the flyover which shall be designed. Wind loads are secondary loads in designing the main girders and primary load in designing the wind bracings.
Primary loads includes dead load, live load impact load and centrifugal forces. Secondary loads includes wind pressure, breaking force, lateral shock effect, temperature effect, frictional resistance at movable bearing, forces due to settlement of supports and effect of shrinkage and creep of concrete.

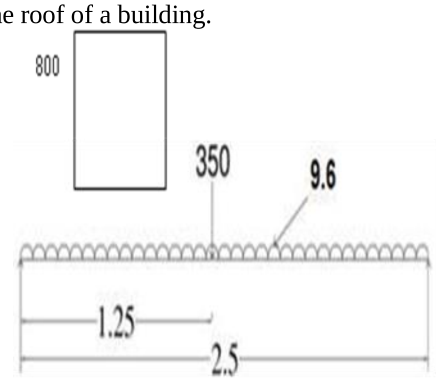
4.PLAN



5.MANUAL DESIGN

5.1. Design Of Interior Panel
Interior dimensions of interior panel
Width=2m
Length=10m
Thickness of wearing coat=80mm
Width of support=50cm
Effective clear width of panel=2.5m
Effective length of panel=10.5m
Weight of slab=6.25KN
Weight of wearing coat=1.76KN
Total dead load=8.01KN/M^2
Factored dead load=12.015KN/M^2
Here ly/lx > 2 therefore it is a one way slab.
Dead load shear=15.018KN
Loading-IRC Class AA Loading
Short span bending moment=40.21kNm
Long span bending moment=11.5kNm
IRC Class A loading:
Short span bending moment=6.54kNm
Long span bending moment=1.87kNm
Maximum short span bending moment=40.21kNm
Total max short span bending moment=69.69kNm
IRC Class AA:
Total bending moment=85.8kNm
IRC Class A loading:
Total bending moment=21.86kNm
Using M20 concrete and Fe415 steel,
Mu limit=85800000
Effective depth=200mm
Area of steel Ast=1388.94mm^2
Assuming 16 mm diameterbars,
Spacing=140mm
DISTRIBUTION STEEL
Bending moment=19.96kNm
Area Ast=284.98mm^2
Spacing for 10mm diameter bars=250mm

5.2. Design Of Intermediate Cross Beam
A cross beam is a long thick bar of wood, metal or concrete that is placed between two walls or other structures in order to support the roof of a building.



Bending moment =226.25kNm
Shear force=187kNm
Using limit state method of design
For Fe 415 steel, fy =415N/mm^2
For M_{20} concrete, fck=20N/mm ^2
MR constant R=2.76
Computation of design bending moment and shear force
Bending moment=339.3kNm
Shear force=280.5KN
Computation of effective depth
For a balanced section
Depth =554.43mm^2<760
Steel reinforcement
Area of steel=1132.51mm^2
Using 20mm dia bars
No.of bars=4nos
Actual area of steel=1256.63mm^2
Required moment,Mur=315.24*10^6Nmm
Ultimate moment,$M_U$lim=637.67*10^6Nmm
M_{ur}<$M_U$lim the design is ok
Check for shear
V_u=280.5*10^3N
Nominal shear stress=0.922N/mm^2
Permissible shear stress
Percentage of steel=0.41%
From IS 456,table 19
Provide shear reinforcement
V_{us}=149780N
Spacing for 2 legged 10mm stirrups

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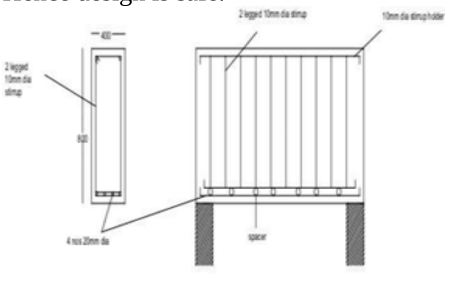
S_V=287.77mm
Say 250mm c/c
Check for minimum steel area
S_v=354.4mm>250mm
Hence safe.
Space occupied=160mm<400mm
Check for deflection
Span/effective depth=20 for simply supported
But,span /effective depth provided=3.2<20
Hence design is safe.



INTERMEDIATE CROSS GIRDER

6.CONCLUSION

This project concludes the planning and design of flyover structures. This structure reduces the traffic control and enhances the driving. The structure is designed as per IRC class AA loading. This project helps to reduce traffic conjunction.

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